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U.S. Soil Conservation

December 1978

U.S. Department of Agriculture

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From the Administrator

Innovations in SCS Planning Assistance

SCS a few months ago launched a new approach to conservation planning. In essence, we asked SCS field personnel to begin working more flexibly with conservation districts and their cooperators in planning only what land users want and need to sustain soil and water resources.

We asked the field staff to continually use their knowledge, initiative, creativity, and management skills to provide the kind of help people want.

The new approach is responsive to some recommendations of the General Accounting Office; the findings of recent studies, notably a statewide study by the North Dakota Association of Conservation Districts; and SCS's own evaluations of years of planning experience.

Most land users, we learned, carry out planning decisions within the first 2 to 3 years after planning. No single factor is more important than that in the SCS redirection to more flexibility.

Conservation planning is just as important today as it ever was, probably more so as demands on the natural resource base increase.

But we need to keep planning in perspective. It is a continuing process, and a conservation plan is an intermediate step in the process—not an end in itself.

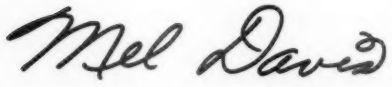
Our vital, critical goal remains what I call our final product: conservation on the land, positive results on the ground.

SCS had the cooperation of the National Association of Conservation Districts in developing the new planning concepts. And we have been encouraged by NACD and other conservation officials to pursue their implementation with vigor.

In a recent letter to SCS employees, I expressed the belief that we will succeed in the new planning approach to the degree that SCS, districts, and cooperators work together in greater harmony.

The SCS planning concepts offer all of the conservation partners at the local level the opportunity to meet the challenge of unremitting change and mushrooming demands in resource management.

It is probably too soon to tell how well the new approach is working nationwide. But like the end product SCS and districts seek together, the measures of our progress eventually will be highly visible: More SCS and conservation district conservationists out of the office and out on the land, working and talking with land users, examining, evaluating, and promoting conservation practices and conservation systems.



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Secretary of Agriculture

Mel Davis, Administrator
Soil Conservation Service

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Cover:
Farming reclaimed surface-mined land is a successful venture for one Pennsylvania landowner. See article on pages 8 and 9. (Photo, Lee Shields.)

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Calls from the Wild

by Gordon S. Smith

An office complex looks like it grew up with the grass and trees in a New Jersey community, thanks to natural resource planning.

"It's an office complex that combines strict environmental protection requirements with business management needs," said Candace Ashmun, environmental commissioner for Bedminster Township, N.J. She was describing the recently completed American Telephone and Telegraph (AT&T) Long Lines Department national headquarters which sits on a wooded hillside overlooking the North Branch of the Raritan River.

"We enjoyed the option of accepting the AT&T building proposal only if it met the exact specifications of our township planning and zoning ordinances," said Ashmun, who is also an official of the Upper Raritan Watershed Association. "AT&T agreed to do everything we asked so the result is good land use for this tract of land."

AT&T Supervising Engineer Burdick Pierce added, "This new Long Lines facility represents the most extensive conservation planning project of any new AT&T office building. For years we have consciously guarded against excessive uprooting of the surrounding landscape when new facilities were being built. Tree planting and land protection have been important elements of our construction work. But this Bedminster project marks the first time that the buildings and everything connected to them have been planned to fit into the surrounding environment."

Faced with the necessity of moving from their inadequate New York City Long Lines office, AT&T officials considered 55 possible locations for a new office in northern New Jersey. They were restricted to that general area because they needed to be near other Bell System facilities that were already built or under construction. A 422-acre tract between Interstate Highway 287 and the North Branch of the Raritan River in Bedminster Township met most of their requirements.

Bedminster Township is made up of rolling wooded hillsides dotted with estates and old farms. Its geology, soils, topography, and location at the headwaters of the Raritan create a fragile environment. The township, to protect the environment, strives to maintain a low-density land use pattern. The fact that the new AT&T facility had the potential to double their tax revenues held little interest for local people. Bedminster could afford to insist on a complete natural resource conservation plan for the new AT&T office complex. AT&T officials agreed to follow the township's land use restrictions.

A few years ago, Bedminster's planning and zoning board redrafted the local zoning ordinances to require the investigations and provide the flexibility needed for making sound land use decisions. Included in these ordinances were requirements based on New Jersey's "Standards for Soil Erosion and Sedimentation Handbook." The Soil Conservation Service had given the State technical assistance in developing the standards. SCS work in resource conservation

During construction, runoff passed through the debris basin (far left), where most of the silt settled out. Today, this same debris basin (near left) is part of the landscape and overall drainage system.

and the agency's county-by-county national soil survey program provided the basis for much of the information in the handbook and in the Bedminster ordinances. The $40 million AT&T project gave Bedminster its first real chance to test the safeguards.

Based on local input and the Bedminster planning board's environmental requirements, the office complex was designed to fit the landscape. Though AT&T had purchased 422 acres, only 29 acres were involved in the building project. The rest will be kept open under a perpetual deed restriction. The low profile of the building and the surrounding tree cover almost hide the complex from view from nearby roads. All-electric heating eliminates any air pollution problems. A tertiary sewage disposal plant designed to treat twice the estimated needs removes any threat of pollution from that source. The complete conservation landscaping plan eliminates the danger of excessive erosion.

Before approving AT&T's building plans, the Bedminster planning board required an environmental impact statement from the company detailing all aspects of the proposed project and the effects of construction and the finished complex on the community's natural and economic resources. In approving the AT&T plan, Bedminster officials also required that several conservation measures be included. The Somerset-Union Soil Conservation District and the SCS technical staff that works through the district advised the township on the needed conservation measures.

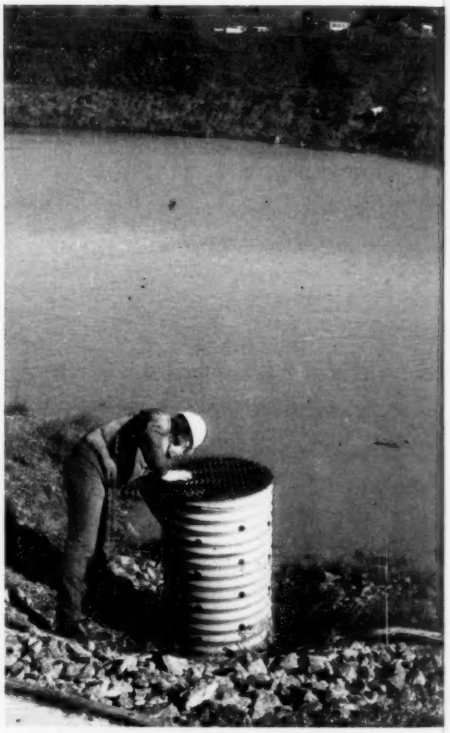
With AT&T funds, the township hired an engineer to be a full-time inspector on the construction site during the 38-month building period. The inspector checked compliance with all the environmental requirements set by the Bedminster planning board. A monitoring committee was also established to report environmental concerns to the township during construction.

When construction was started, the first conservation step was shaping two large debris basins at the foot of the hillside below the building site. Two diversions—shallow ditches backed by a mound of earth—ran 1,800 feet across the lower side of the construction area to the two basins. These diversions collected all runoff water and carried it to the basins, where most of the silt settled out. Then, as the runoff water passed through the basins' outlets to the small natural stream below, small dams made of baled hay intercepted any remaining silt. By the time the water from the construction site reached the Raritan River, it was practically free of silt. The two debris basins were designed to hold back millions of gallons of potential floodwater during excessive storms.

In clearing the land for construction, 130 trees were carefully removed and stored in a temporary tree nursery beyond the site. Wood chips from trees that had to be destroyed were stockpiled for later use.

At left, natural woodland vegetation was left undisturbed within a few feet of the building during construction. At right, about 130 trees of various sizes and species were transplanted to a temporary nursery before construction began. The trees were used later in landscaping the new office complex.

The outlet pipe at this debris basin was designed to hold back sediment while excess water passed on to the river. SCS designed the basin as part of the conservation plan.



Topsoil from the site was removed and stockpiled for use in landscaping work. The 3,500-cubic-yard topsoil hill was dwarfed by an even larger mountain of earth excavated from the building site. Both mounds were seeded with temporary grass mixtures to prevent erosion. In fact, any disturbed land was seeded or otherwise stabilized within 30 days, according to the land use specifications.

The perimeter of the construction site was fenced to keep construction equipment out of adjacent undisturbed areas. Both AT&T and Bedminster wanted to have as much land as possible remain in its natural, undisturbed state.

To insure continued good water quality in the North Branch of the Raritan River, nine water-sampling stations were set up on tributaries on the AT&T property. Biweekly recordings of water quality before, during, and after construction provided data to insure that the Raritan River remained an acceptable water supply and that fishing continued to be as good as ever.

Today, the AT&T Long Lines office complex is complete and doing business. More than 3,000 employees are working in an office atmosphere surrounded by many of the advantages of country living. Inside, tropical trees and flowering shrubs dominate a four-floor, skylighted atrium in each of the three sections of the complex. Outside, the landscaping, though not yet a year old, looks like it has been in place for several years.

A large beech tree planted near the visitors entrance stands taller than the building. It was one of the 130 trees stored in the temporary nursery during construction. More than 90 other trees of all sizes were transplanted from the nursery to become part of the new landscape around the building.

The diversions below the building site have been leveled. They are no longer needed because the ground is now protected by lush grass.

Instead of running into the Raritan River, this sediment (left) has been captured and stored in the debris basin.

Natural drainage patterns at the site were maintained as much as possible (right). Here, two small streams meet to run down the slope just as they did before construction began.

This grass-covered hill is actually a 3,500-cubic-yard mound of topsoil shaved from the construction area. It has since been spread on the land around the new AT&T buildings.

The smaller of the two debris basins, built to hold the muddy runoff from the diversions, is also gone. The other debris basin has been made into a picturesque pond, as planned, and it still has the flood control capability of holding back excess water from the nearby Raritan River during heavy rainstorms.

The mountain of topsoil stockpiled during construction has been spread across the land disturbed by construction. It was sodded and seeded and now has a deep grass cover.

Nature trails made of wood chips from discarded trees wind through the nearby wooded areas that were untouched by the construction work. In a few places, access roads that were needed during construction have been made into nature trails. The trails get considerable use by AT&T employees during lunchtime when the weather permits.

The usual acres of asphalt parking lots that surround most large office buildings do not exist at the AT&T complex. Two multilayer garages have kept this type of land use at a minimum.

Looking to future landscape efforts, AT&T Engineer Pierce reports that a land management plan for postconstruction conservation work is already in operation. Ashmun has recommended various procedures for maintaining adequate erosion and water runoff control. Drainage ditches need to be kept mowed and cleared of debris. Some grassed areas near the woods should be allowed to revert to their taller natural vegetation. A layer of wood chips needs to be maintained around shrub plantings, especially on slopes. This will control any possible erosion in those areas plus provide some nutrition to the plants. Another nature trail along the Raritan River is planned to connect with the existing trails.

"We think our new Long Lines building is an outstanding example of a large office complex designed to fit the specific requirements of the land it is built on and still meet our original objectives," said Pierce.

Recently, AT&T Long Lines received the Good Neighbor Award from the New Jersey Business Magazine for their outstanding environmental work. Conservationists involved in the project agree that it is an excellent example of tailoring industry to fit the landscape. As such, it sets the pace for better conservation planning in similar developments and represents a tremendous advance in the continuing effort to bring about proper land use in many fast-growing urban communities.

Mr. Smith is head, information staff, Northeast Technical Service Center, SCS, Broomall, Pa.

Adapted from an article in *Landscape Architecture*, May 1978 issue.

At left, juniper plants and wood chips protect this sloped garden area near the new offices. Wood chips were also used to cover a nature trail (at right, foreground), which provides employees with a relaxing walking area.

A Better Farm After Coal Mining

by Frederick E. Bubb
and Lee B. Shields

Long after the coal is gone, the crops will still be thriving on a reclaimed farm in Pennsylvania.

Good mined-land reclamation puts a feather in the cap of the miner and the farmer, Glenn Scott says.

He should know—he has returned two farms to agricultural production after they were stripped for coal.

A fourth-generation dairy farmer in Pennsylvania's pleasant Stony Creek Valley, Glenn was not about to give up his career or his natural resources just because the slopes behind his house contained a million dollars' worth of coal.

Surface mining elsewhere in Somerset County and throughout the Keystone State had left lasting scars on local communities. Recent State and Federal laws will help repair some of those scars and prevent them on new mines, but Glenn says that "too many times the fault is with the landowner. He cannot wait until the mining is finished to make decisions or plans to restore the land.

"Inspectors are watching mine operators for today's safety and water quality problems. There is not enough looking to the future use. Every landowner should have a conservation plan before he allows stripping."

Glenn and his wife Janet and son David run a 105-acre dairy farm that supports 43 milk cows and 40 heifers and calves. The farm of Janet's parents just across the road was stripped for coal beginning about 1960. Glenn was impressed with the coal company's work, and with his own ability to help return the farm to good production.

The coal shovel came to his own hillside 8 years ago, and the Scott farm became one of the more than 200 active mines in the county.

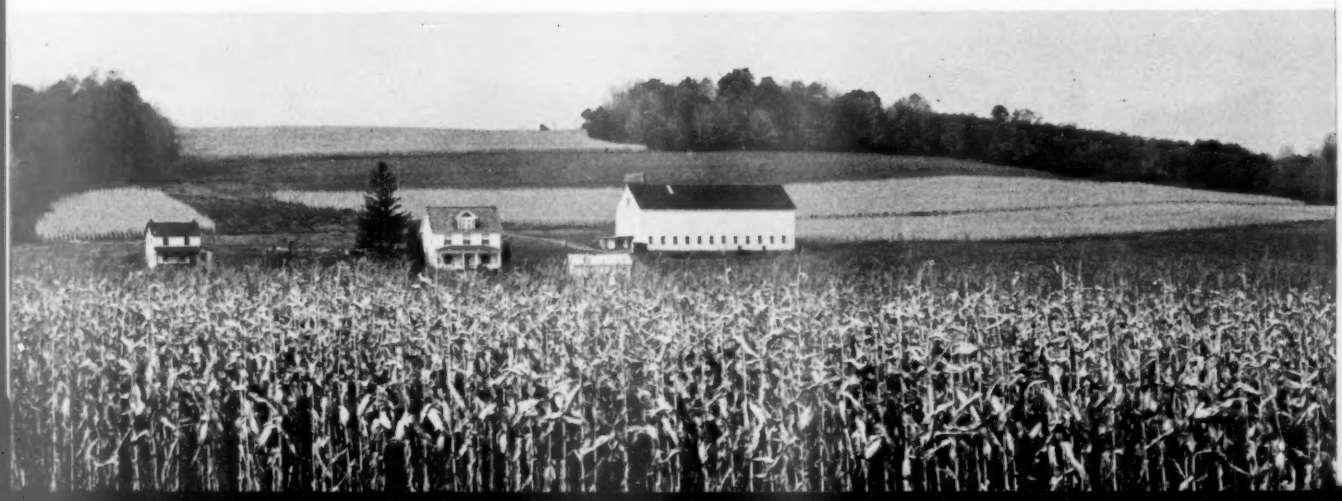
Glenn didn't mind having part of the hill removed. "Before stripping, I had two steep ravines breaking up this slope," he said. "I had contour strips and a diversion, but because of those ravines, my fields were short."

A long-time cooperator with the Somerset County Soil and Water Conservation District, Glenn made sure that his agreement with the coal company for the mining and reclamation included contour strips, diversions, and grassed waterways. They were planned with the help of the Soil Conservation Service and installed by the coal company.

The agreement also specified that Scott and the coal company would share equally in costs for lime, fertilizer, and seed. Lime and fertilizer needs for restoring fertility were based on a soil test. Glenn was surprised that only 2½ tons of lime was needed per acre.

Other parts of the mining and restoration work were verbally agreed to by Scott and the coal company. That worked fine, Glenn said; the company foreman was there virtually every day assuring a good job. But Glenn recommended that a farmer have every phase planned and agreed to in writing, to protect himself and the miner.

The agreement also should provide for removing and stockpiling topsoil



and subsoil separately, Glenn says. "The best way is to use the soil survey to determine the average depth which should be stripped off."

Glenn allowed some building debris and other waste to be buried in deep pits. He wouldn't advise anyone else to do it—parts of the hillside have settled differently and affected the diversion terrace grades. Specifications for dumping and backfilling should be set down in advance.

When the reclamation is done and the farming resumes, Glenn says the farmer should return as much organic material as feasible to the soil each year. Animal waste can help rebuild soil fertility and structure—its effect will show up faster than anything else.

A few wet areas remained after the mining, although the stripping actually improved drainage on the Scott farm. Glenn advised, "Don't be in too big a hurry to go to underground drainage. Wait a few years until the soil structure rebuilds. This may solve the wetness problem. If not, then the farmer can ask SCS to help establish a drainage system."

Glenn figured that it would take 3 or 4 years to get the farm back into shape after half of it was mined. He is right on target.

In the first year, he harvested 10 tons of corn silage per acre—about half the usual yield. He also combined 25 bushels of buckwheat per acre and got an excellent stand of grass-legume hay.

Not bad considering the hillside was still in spoil piles until April that year! Not bad considering he thought his only crop would be stones!

His first returns were enough to cover seed and fertilizer costs, and improved the next year. He figures that in another year or so yields will be as high as they ever were—or better.

Glenn is most proud that "From my part of the hill, no silt has ever reached the road. That isn't true on other farms.

"My son wants to farm, and I want him to have a better farm than I did. I would not have removed the coal if I was not sure I could retain my agricultural land and production."

The Scotts have protected their land and their future, as well as doing their share to guard the quality of Pennsylvania's streams. Janet Scott says, "You have to make every acre count."

The Scotts feel strongly that the landowner needs to take some responsibility to see that surface mining does not leave an eyesore.

They have done just that—and more.

Mr. Bubb is public information officer, SCS, Harrisburg, Pa.
Mr. Shields is assistant director, Information Division, SCS, Washington, D.C.

Some of the contour strips on the Scott farm cover scars of surface mining.

Glenn Scott and SCS District Conservationist Ron Phelps discuss good growth of soil-holding plants on a surface-mined hillside.

SCS District Conservationist Paul Edwards (left) and Warren Roelkey discuss the conservation practices installed on Roelkey's farm in Frederick County, Md.

All in a Day's Work

One day,
500 volunteers,
200 machines,
and
13 conservation
practices
on
245 acres
add up to
reduce erosion.

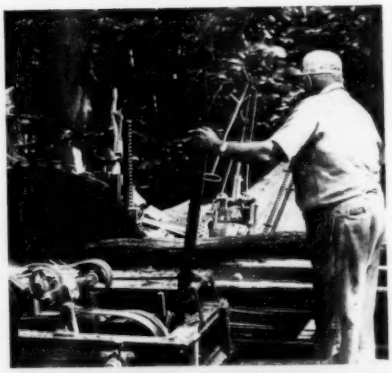
by Ted Kupelian

While helicopters and airplanes circled overhead, about 500 volunteers, 200 machines, and several thousand onlookers joined forces in a down-to-earth display of community pride and cooperation. Called Project Clearwater, the massive 1-day conservation demonstration showed farmers and others how to prevent erosion and water pollution from agriculture.

The 245-acre Warren Roelkey farm in Frederick County, Md., was se-

A bird's eye view of the Roelkey farm shows some of the work well underway—the pond (center), contour stripcropping (background), fencing, and barn repair.

At right, trees, which were thinned as part of the timber stand improvement plan on the Roelkey farm, were sawed into lumber. Daniel C. Poole, Project Clearwater chairperson and member of the Catoctin Soil Conservation District, takes a turn at the saw mill (top photo). Volunteers used some of the lumber to improve fencing on the farm (bottom photo).



Throughout the day, tractors pulled haywagons full of visitors around the farm to 13 tour stations. Guides at each station explained the conservation practice being installed and other improvements.

lected by the Catoctin Soil Conservation District as the site for the transformation.

The Federal Water Pollution Control Act, passed in 1972 and amended in 1977, requires farmers to control, to the extent feasible, nonpoint source pollution, including soil, animal wastes, fertilizers, pesticides, and other chemicals that wash off land and pollute waters.

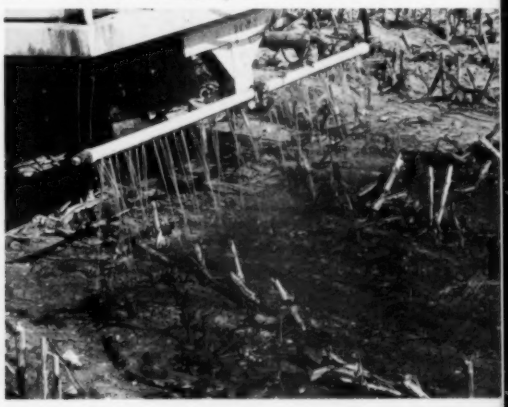
Land which is under development puts the highest amount of sediment, per acre, into streams, but badly managed farmland is the second largest cause of erosion.

About 3 billion tons of soil wash off the Nation's cropland each year. Before Project Clearwater, about 2,900 tons of soil on the Roelkey farm eroded annually. After the project, erosion should be reduced by about 80 percent.

Conservation practices installed during Project Clearwater included contour stripcropping, relocating fences, tile drainage, pasture renovation, a 1.1-acre pond, waterways, diversions, timber stand improvement, livestock watering troughs, a walk-in watering facility, an animal waste management system, stream stabilization, and a drop structure.

Mr. Kupelian is a writer-editor, Information Division, SCS, Washington, D.C.

Silage was cut and carried to a concrete-lined trench silo. The corn was cut, in strips, while still green. In the silo it will produce an acid which prevents it from spoiling. The silage is fed to livestock during the winter when they are unable to graze. On the strips where the corn was cut, the seedbed was prepared for a mixture of timothy and clover.



Volunteers installed diversions on the contour to reduce the distance water must flow downhill in the sloping fields and to direct the water to suitable outlets.

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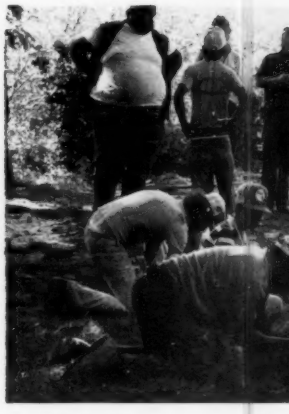
"Before" and "during" Project Clearwater—the barn takes on new boards and fresh paint and a new fence goes up around it.

Below, two types of livestock watering facilities were installed on the farm. One was a concrete trough with concrete apron and the other was a walk-in facility built of cross-ties.



Above, as bulldozers work on the pond in the background, volunteers repair the springhouse and prepare a trench. A pipe will be buried in the trench to carry overflow from the pond to the stream.

The Maryland Water Resources Administration installed a water monitoring device in the stream. Samples taken after Project Clearwater will be compared with "before" samples for improvements in water quality.

Workers lay sod for one of the waterways. They begin at the lower end of the grade and work up. Like shingles on a roof, the sod strips at the upper end overlap the lower ones, thus preventing water from forcing up the edges.

Below, gullies in the pasture had to be filled in and shaped before seeding.

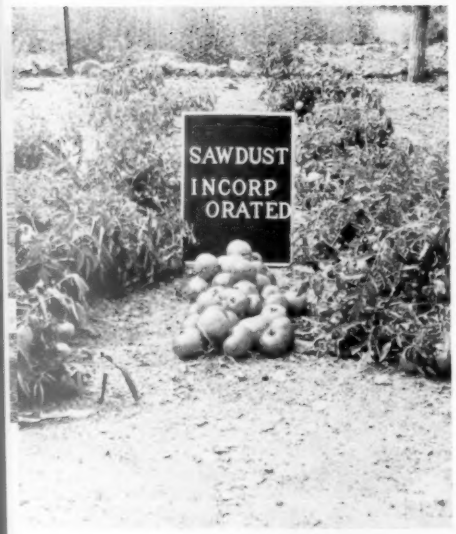
Spraying a mixture of water, grass seed, fertilizer, and mulch on disturbed areas around the pond—including the banks, dam, and spillway—will help grass to root quickly. The grass will anchor the soil and prevent erosion.

At left, bulldozers dug in to build a 1.1-acre pond on the farm. The pond will catch runoff water from the mountains and provide water for livestock.

Crops Sprout on Spoil

by Ronald D. Morse,
John M. Swiader,
and P. J. Porpiglia

Turn a mine spoil into a vegetable garden? Virginia scientists say yes, with the help of sawdust and black plastic.



Tomatoes were grown on strip mine spoil (above) to which sawdust had been added. The sawdust improved the soil's water infiltration and retention rate. The yield of vegetables grown on the mine spoil (right) was comparable to the national average.

To landowners and mine operators surface-mined land has been more of a nuisance than an asset. It is associated with problems of erosion and pollution. Speculations that perhaps one day the land could be used for agricultural production were left to dreamers. But, based on the results of trial plantings made on areas of reclaimed surface mine spoil in southwestern Virginia, it could be more than just wishful thinking.

In 1976, researchers at Virginia Polytechnic Institute and State University began working on a new use for surface-mined land spoil—vegetable production. Field studies were conducted at actual mine sites to determine the cultural practices required to support vegetable production on mine spoil.

Grants for the work were received from a local coal company and from USDA's Science and Education Administration supported by the Interagency Energy/Environmental program of the U.S. Environmental Protection Agency.

The two planting sites selected were 2- to 3-year-old surface-mined areas in Wise and Buchanan Counties. They were relatively flat and had no serious erosion problems. The two sites had also been properly mined and stabilized. Most of the pyritic, or acid forming, materials had been deposited beneath the more productive shale and sandstone overburden. After mining and the replacement of overburden at the sites, the spoil had been graded, leveled, limed, fertilized, and seeded with a standard mixture of sericea lespedeza and Kentucky 31 tall fescue.

Before planting in the spring of 1976, the soil was tested to determine its physical and chemical properties. The pH averaged 5.2 at the site in Wise County and 7.9 at the site in Buchanan County. The spoils were classified silt in texture and had weak physical structure and porosity de-

velopment. The organic matter content was very low, resulting in crust formation and poor water infiltration.

The research in 1976 focused on evaluating the effect of using sawdust as an organic amendment to improve the soil and increase crop yields. Lime and fertilizer were added based on the soil test and on standard vegetable requirements for Virginia soils. Weathered sawdust applied at 20 tons per acre (dry weight) was either incorporated into the top 6 inches of spoil or used as a 1-inch surface mulch. A control plot was established which was not treated with organic additives.

Green beans, cabbages, tomatoes, and sweet peppers were grown under each spoil treatment and evaluated for yield, quality, and their overall adaptability to mine spoil. Except for one nitrogen application midway through the growing season, the plants were given no additional fertilizer.

Results from the first season were very promising. Yields of cabbages, tomatoes, and green beans under sawdust treatments were on the whole comparable to the U.S. average and the vegetables were of excellent quality. Yields from the control plots were considerably less than those of both sawdust treatments and the vegetables were of inferior quality. The sawdust treatments improved the soil's water infiltration and retention rate. These properties appeared to be the factors most limiting to normal plant growth and development.

In 1977, the research was expanded to include an evaluation of black plastic mulch on surface mine spoil. The number of vegetable species was also increased to include broccoli, cucumber, summer squash, and winter squash.

Results from the 1977 season averaged higher yields than the previous year. Except for broccoli, all vegetables grown on the plots treated with sawdust were equal to or superior to the U.S. average. The black plastic proved to be an especially effective mulch for warm season vegetables such as tomatoes, peppers, cucumbers, and squash. Yields of most species grown on plastic mulch were double that of the control plots where no mulch was used.

From the results of the research, vegetable production appears to be a viable alternative for the use of surface-mined land. Through the use of organic amendments, surface mine spoil can be modified to support vegetable crops. But whether it is feasible on a large scale remains to be seen.

Mr. Morse is an associate professor of vegetable production, Mr. Swiader is a research associate, and Mr. Porpiglia is a graduate research assistant at the Virginia Polytechnic Institute and State University, Blacksburg, Va.

Strip mining causes total upheaval of the land, often leaving it barren and scarred (right). If toxic materials are covered with nontoxic overburden, the area can be reclaimed and stabilized with plant cover. On the sites selected for testing, the newly deposited strip mine spoil had to be leveled, graded, and fertilized (far right) to prepare it for planting.

The Eyes Have It

by Steve Foland

The environmental eye uses switchback and diversion tactics to set a trap for animal waste.

"Environmental eye" may sound like a spy in the sky, but to dairy farmers in southwestern Wisconsin, it means inexpensive and effective control of animal waste.

The Lafayette County, Wis., Soil and Water Conservation District (SWCD) coined the term in 1973 for a waste management system made up of a diversion above and a retention dam below a barnyard. Viewed from the air, the diversion and dam combination looks like a giant eye.

The diversion prevents run off from higher surrounding land from running through the barnyard. The retention dam keeps the water that falls on the barnyard from running off and carrying animal waste into waterways.

"The typical barnyard around here is steep and is beside a stream," said Orville Kurth, Soil Conservation Service district conservationist in Lafayette County. "Almost every barnyard in the county could use some form of runoff control, but some need less than a complete environmental eye."

The barnyard on the farm owned and operated by Guerdon Voights and his son Harry is so high on the landscape that an upper diversion would have served no purpose. A spring-fed stream, however, runs by below the barnyard. "We had to keep waste out of the water somehow," said Harry. "The stream runs through the town of Belmont after it leaves here."

The Lafayette County SWCD and SCS helped the Voights construct a concrete slab waste-holding area, a retaining dam, and a holding pond for liquid waste below their barnyard. It took 2 years to complete the work.

"We were shocked at the amount of waste the dam trapped," said Guerdon. "Before the dam was built, I guess the waste just disappeared into the stream."

The Voights always had a field road below their barnyard. The road was gullied, difficult to keep graveled, and sometimes washed away. Since the installation of the retention dam, the Voights say the road is stable and easy to maintain.

On another Lafayette County farm —owned and operated by brothers Bill, Ron, and Doug Woodworth— runoff from about 10 acres of cropland passed through the barnyard. A highway runs by the barnyard, and, as Doug said, "That road carries a lot of city traffic. People could look right down into our barnyard, and it was getting pretty messy."

The Woodworths decided to use the waste from their barnyard as fertilizer for their crops. They worked with the Lafayette County SWCD and commercial engineers to design a system most suitable for their needs. The brothers constructed two extensive diversions above the

barnyard to eliminate the runoff from the cropland, then built a 4-foot-high wall below the barnyard to trap the animal waste. A pump beside the wall transfers the waste by pipe to a commercial holding tank that the Woodworths installed near the highway.

"We knife the liquid waste into about 120 acres of cropland," Doug said, "and we have cut our fertilizer bill on that land in half.

"When we went into this, we expected the system to pay for itself in 10 years. It looks now like the system will pay for itself in 4 years, not including the savings in labor that the diversions and wall brought about."

In Crawford County, SCS helped Glen Beneker design a serpentine diversion system below his barnyard to catch and hold runoff waste. The serpentine forces the runoff to travel across the slope on the contour for some distance before allowing it to descend and switch back along the slope. The successive diversions slow the water considerably, reducing its ability to transport barnyard waste.

"I had my doubts about the diversion's effectiveness when it was being built," said Beneker, "but you can see that the third switchback is virtually free of waste. And the only maintenance the diversion requires is periodic removal of dried waste."

In constructing their tailormade versions of environmental eyes, the Voights and the Woodworths received cost-share assistance through the Agricultural Conservation Program. The Benekers received cost-share funding from the Crawford County SWCD.

The Woodworths were committed to cleaning up the area beside the highway even if funds had not been available, but the Voights and the Benekers might not have constructed environmental eyes if there had been no cost-share assistance.

"Most farmers around here," said Harry Voights, "know that something has to be done about the waste problem. But it's difficult for a farmer, especially a struggling farmer, to set aside money for pollution control practices. The cost sharing helps a lot."

Considering that many farmers could install environmental eyes for only a few hundred dollars, the eyes may be an inexpensive part of the solution to a costly nonpoint pollution problem.

Mr. Foland is chief, conservation news & reports branch, SCS, Washington, D.C.

Far left, a retention dam on the Voights' farm not only traps barnyard waste but makes it easier to maintain the field road that runs below it as well. Left, a concrete "well' beside the Voights' retention dam skims the liquid waste for gravity transport to a holding pond.

Doug Woodworth (left) and his brother Ron explain their waste management system which includes a liquid manure holding tank (background) and a slurry spreader.

Looking for Trouble

by Roger Howell

Michigan conservation districts set goals, tackle their resource problems, and score.

In just 4 years, 15 erosion control structures were installed in one-fourth of the Newaygo Soil Conservation District (SCD) in Michigan—more than had been built in the entire district in the previous 25 years.

Frank Wentland, chairman of the Newaygo SCD, credits the district's success to its High Priority Goal Program. The program is a new approach to solving conservation problems. Through it, the district first identifies the most critical conservation problems and their locations and then concentrates all its available resources on solving them.

Instead of waiting for requests for technical assistance in problem areas, the Newaygo SCD now pinpoints conservation problems and offers landowners needed assistance. While the district concentrates on solving critical problems, it continues to provide everyday conservation assistance to farmers and other cooperators; but all promotional efforts are limited to high priority areas on high priority problems.

Soil Conservation Service District Conservationist Dick Rose, now Sauk Trails Resource Conservation and Development area coordinator in St. Joseph, Mich., helped the Newaygo SCD directors select the critical areas and set their conservation goals. The directors knew there were problems with erosion, flooding, unmanaged woodlands, and poor land use and that the problems existed in less than half of the district, but no one had ever really pinpointed them before.

Their first two top priority areas were easily determined—the Rogue River watershed project and a woodland management project. The SCD already supported and cosponsored the watershed project which is to reduce flooding in the district, and the manager of the district nursery just completed a study that identified areas needing reforestation and woodland management.

Another area they chose to concentrate on included public land and cash crops, fruit, and dairy farms in the vicinity of many lakes and streams. Land users in this area were having problems with water erosion so the district designated it for their erosion and sediment reduction objective. The directors also identified areas of the district that have light sandy soils that need protection from wind erosion.

The SCD directors then took a hard look at the problem areas they had identified to determine what conservation practices were needed. They set 5-year goals for each practice. The district directors asked SCS to concentrate on erosion control and soil protection in two of the high priority areas. They hired an information specialist to promote their reforestation and woodlot management objective and to carry out the district's conservation education program.

Some of the practices the Newaygo SCD set goals for included tree planting, critical area plantings, and grassed waterways. The 5-year goal for tree planting in high priority areas

After the Newaygo SCD adopted the High Priority Goal Program, it saw a dramatic increase in needed erosion control structures.

At right, SCS District Conservationist Glenn Lamberg (left) meets with Frank Wentland, chairman of the Newaygo SCD, to discuss what still needs to be done in the high priority areas.

was 1,000 acres. The district is 4 years into the program and has planted 906 acres of trees so far.

A goal for critical area plantings to reduce erosion and sedimentation was 290 acres. The district has already exceeded that by 2 acres.

In the high priority areas outlined for managing cropland for production with protection and erosion control, the district set a 5-year goal of 12 acres of grassed waterways. Nine acres have been installed and District Conservationist Glenn Lamberg is confident that the 12-acre goal will be reached or exceeded as scheduled this year.

The district has also continued to support and encourage completion of the Rogue River watershed project. Using Comprehensive Employment and Training Act funds, the district has a six-member crew to plant trees, thin and prune existing trees, work on streambank stabilization, and seed roadsides.

"The conservation work we are doing now is more visible because we are addressing known problems," said Newaygo SCD board member Pete Smalligan. "People are more aware of conservation work now and the district is better known."

The high priority concept used by the Newaygo SCD is being used by the other Michigan SCD's.

Julius Kolarik, chairman of the Leelanau SCD, said, "The High Priority Goal Program has helped Leelanau County use its resources more efficiently and effectively to solve the most severe erosion problems in the county. The reason it worked so well is that we have been able to concentrate our efforts in areas with severe conservation problems without neglecting isolated problems in other areas."

"The high priority goal concept is working well for us," said Elmer Schmuckal, chairman of the Grand Traverse SCD. "Windbreaks, strip-cropping, and other needed conservation practices are being applied on land I didn't think would ever be treated."

When asked how the high priority method works in the Washtenaw SCD, Chairman William Fishbeck said, "Frankly, it has worked much better than we thought it would. Most people have priorities in their own lives and they understand that organizations have to function that way too. In fact, they expect us to, because they want us to do the urgent work that needs to be done."

SCS in Michigan is convinced that a high priority program that identifies problem areas and their conservation needs is effective. "We are having a greater impact on critical conservation problems," said SCS State Conservationist Arthur H. Cratty. "Accomplishments of the Newaygo SCD and other districts in Michigan prove that the high priority concept works."

Mr. Howell is public information officer, SCS, East Lansing, Mich.

Nursery Manager Arvid Shue checks Norway poplar cuttings. When rooted, the trees will be used to establish windbreaks in areas subject to wind erosion.

Putting Up a Good Fight

by Donald Click

Critical soil erosion is no match for the Ninety Six District.

Two centuries ago, the area in South Carolina now making up the Ninety Six District Resource Conservation and Development (RC&D) Area became famous. The first land battle of the American Revolutionary War took place there. But people in Greenwood County and in the five surrounding counties will tell you that the land battle still goes on today—only the adversaries have changed.

Now the local people are fighting soil erosion instead of British troops, and instead of the Continental Army, dedicated conservationists are helping them in the fight.

They are battling critical soil erosion with financial and technical assistance from the Soil Conservation Service through the RC&D program and with help from local soil and water conservation districts and local and State units of government.

On his farm near Ware Shoals in Abbeville County, Bud Brown healed 12 acres of severely gullied timberland. It took two bulldozers 2 weeks to smooth the land. The Ninety Six District RC&D Area provided the funds for seed, lime, fertilizer, and straw mulch for planting the barren land to grasses and legumes. Lovegrass was planted for temporary cover and sericea lespedeza for more permanent protection. Loblolly pine seedlings were also planted.

To control roadside erosion, the South Carolina Highway Department is sloping roadbanks and using a hydroseeder to apply a mixture of lovegrass, sericea lespedeza, and mulch. This critical area treatment makes roads safer by preventing sediment from running off and clogging roads and ditches. It also makes roadsides easier to maintain.

According to the chairman of the Ninety Six District RC&D Area Commission, M. J. Rhodes, one of the best examples of people working together through RC&D is an improved road in Edgefield County. After a heavy rain shower, the school bus couldn't make it through because sediment had clogged the roadside ditches and the water was too deep in the road. "When the county road supervisor visited the site, he said that he would have equipment there the next day," said Rhodes. "The roadbanks and rights-of-way were reshaped and smoothed, and RC&D funds were used to contract for the seeding."

Besides the critical area treatment applied to 650 acres in the Ninety Six District through RC&D, the people in the area are preserving historical sites, controlling floods, and participating in conservation education.

There is still much to be done. But folks in the Ninety Six District are proud of what they have accomplished through RC&D assistance in the last 3 years.

Mr. Click is resource conservationist, SCS, Anderson, S.C.

Eroding fields like this one (top) in Laurens County are a major cause of downstream sediment damage. SCS District Conservationist J. W. Black (bottom) examines area after grasses and legumes were planted. There is good cover even after a severe winter and a hot, dry summer.

Christmas Trees Trim Erosion

by Frank Jeter

For many people, Christmas trees bring to mind mistletoe and holly, brightly wrapped packages, and caroling. For Christmas tree farmers in the mountains of North Carolina and elsewhere, growing and harvesting the trees is a thriving business.

In North Carolina alone, more than a million trees were marketed in the 1977 holiday season. The number is expected to increase in 1978, according to the president of the North Carolina Christmas Tree Association, Hal Johnson.

Julian Benfield, a tree farmer in Avery County, N.C., runs a nursery on 30 acres on a steep hillside. The 20 acres he has in Christmas trees are planted only to Fraser fir. "Folks want the best when planning a joyous holiday," Benfield said. He must be right, because he sells every tree that grows to a marketable size.

More than half of the trees he sells will be sold for transplanting. Instead of being cut, the trees are sold with a ball of earth around the roots which is wrapped in burlap. People from as far away as Philadelphia, New York, and New England buy trees from Benfield.

But besides their part in holiday festivities and the income they bring to farmers, Christmas trees are also helping keep the soil in place on steep mountain slopes.

No ground is left bare on Benfield's steeply sloping nursery. A thick turf of grass grows between the rows of trees, protecting the fragile topsoil.

"With this sloping land, if you don't protect it, one good rain could strip it," Benfield said. For technical help with his conservation work, he relies on the professional services of Soil Conservation Service District Conservationist Cam Wyatt.

Protecting the soil is so critical on the steep slopes that Benfield uses no chemicals to control weeds growing among his Fraser firs because the chemicals might kill the protective grass. Instead, he uses a power scythe, which looks like a chain saw but has rotating cutters, to control unwanted growth.

Benfield's conservation efforts are highly effective in protecting the soil, and his holiday trees are spectacular.

Mr. Jeter is public information officer, SCS, Raleigh, N.C.

SCS District Conservationist Cam Wyatt (left) and Julian Benfield, tree farmer, look over future Christmas trees grown on a steep hillside. Without protective cover, the hillside would quickly erode to bare stone. Benfield protects the hillsides in his nursery (bottom) with the trees themselves and with a thick cover of grass between the rows.

Research Roundup

Frost-Measuring Network Predicts Winter Flooding

Accurate winter flood forecasts may be facilitated in the near future through the use of a network of frost-measuring devices, reports USDA's Science and Education Administration (SEA).

Severe winter floods occur frequently throughout the Pacific Northwest, endangering life and property. Flooding is caused by water runoff when rain falls on snow or on bare, frozen ground.

Accurate flood forecasts would provide warning for people to evacuate danger areas or take other evasive actions. SEA researchers are working on a watershed model to incorporate frost measurements into runoff forecasts.

The model could use the depth of frost to determine how much moisture the soil will absorb. If the soil is frozen to a sufficient depth, no moisture is absorbed and all further precipitation will run off into streams. Rain on snow melts the snow and, with no infiltration into the soil, adds to the problem.

SEA Agricultural Engineer Clayton L. Hanson of Boise, Idaho, is using two devices to measure frost. The primary measurement tool is a soil moisture measuring system consisting of two parts: sensors and a measuring instrument. The system is installed during the summer. In winter months it tells if the ground is frozen to a depth of 30 centimeters (almost 1 foot) which is a solid freeze that will not thaw or absorb any more water.

If there is no moisture in the soil, the soil moisture system will perhaps falsely read that the ground is frozen so Hanson uses a backup device. This is a plastic tube containing a mixture of sand, water, and fluorescein dye. The tube is also implanted in the summer and pulled up in winter. The mixture inside the tube is green when not frozen and brown when frozen, reflecting the condition of the soil.

Both measuring devices are quite accurate and much easier to use than the previous frost-measuring technique. Before, people had to dig into the ground and report how deep it was frozen, a tough and miserable job.

The work was done at the Reynolds Creek Experimental Watershed in southwest Idaho where conditions are similar to those in Idaho, Nevada, and Oregon.

Natural Aid to Tree Growth

Scientists report that it may be possible to grow trees on former strip mine sites where nothing has grown for years. Naturally occurring fungi that increase the rooting of woody plant cuttings are being studied by USDA's Science and Education Administration (SEA).

The fungi are called mycorrhizae and they live in a symbiotic state in plant roots. It is abnormal for most plants not to have mycorrhizae.

In tests conducted on cuttings of bearberry and huckleberry—two popular native landscape plants that are difficult to propagate using normal rooting procedures—more cuttings developed more roots when the rooting medium was inoculated with mycorrhizae.

The increased number of roots increases the plant's nutrient uptake and enables it to become established in soils during the stressful period following transplant. It is also believed that the mycorrhizae produce many other growth benefits in plants well beyond the rooting stage.

"The discovery of this phenomenon could be a major breakthrough in ornamental horticulture," said Robert G. Linderman, SEA plant pathologist at Corvallis, Oreg., who is conducting the studies.

Although it is not known exactly how the mycorrhizae increase rooting, Linderman suspects that the fungi are producing some substances that create a chemical change in the cutting or the rooting environment. This change induces the plant to produce more roots than it normally would.

Future research will focus on understanding the biology behind the rooting enhancement and on determining whether the mycorrhizae rooting phenomenon also occurs in other plants. The ultimate goal is to use these beneficial fungi for practical application in horticulture.

Research Aimed at Restoring Mined Areas

Availability of adequate supplies of topsoil is a limiting factor for revegetation of some areas disturbed by surface mining in the western United States. A soil scientist with USDA's Science and Education Administration (SEA) reports that good quality subsoil mixed with topsoil provides a good growing medium for plants on mined areas. The practice also increases the depth of material that can be spread over mined areas after coal or uranium have been removed.

"Studies show that 25 percent of the specific subsoil we used in the research can be used along with topsoil without any detrimental effects to plant establishment and production," said Gerald E. Schuman, SEA soil scientist.

Because the native soils are generally low in plant nutrients, fertilization is necessary for seedling growth and adequate production but at rates not considered prohibitively expensive—about 60 pounds each of nitrogen and phosphorus per acre.

In many cases, the mixtures of soils improved both chemical and physical properties of topsoil. Many native soils have limited water storage capacity and by adding subsoil material with higher clay content, more water can be retained for plant use.

Schuman's studies are continuing at SEA's High Plains Grasslands Research Station, Cheyenne, Wyo., and at three mine sites in eastern Wyoming.

Meetings:

December	
3–6	American Society of Farm Managers and Rural Appraisers, Inc., New Orleans, La.
3–8	Joint Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Chicago, Ill.
4–8	American Geophysical Union, San Francisco, Calif.
5–7	Western Forestry and Conservation Association, Sacramento, Calif.
6–8	Keep America Beautiful, Inc., Washington, D.C.
11–13	National Symposium on Strategies for Protection and Management of Floodplain Wetlands and Other Riparian Ecosystems, Atlanta, Ga.
January	
3–8	American Association for the Advancement of Science, Houston, Tex.
8–12	North American Game Breeders and Shooting Preserve Association, Kansas City, Mo.
9–11	National Council of Farmer Cooperatives, Las Vegas, Nev.
14–18	American Farm Bureau Federation, Miami Beach, Fla.
22–26	National Cattlemen's Association Convention and Trade Show, Houston, Tex.
28–31	National Wool Growers Association and National Lamb Feeders Association Joint Convention, Las Vegas, Nev.
February	
11–15	Society for Range Management, Casper, Wyo.
13–14	Southern Forest Institute, Inc., Houston, Tex.
13–16	Air Pollution Control Association, Gainesville, Fla.
13–17	Association of Interpretive Naturalists, Inc., Bloomington, Minn.
14–17	American Association of School Administrators, New Orleans, La.
14–17	Land Improvement Contractors of America, Nashville, Tenn.
19–24	American Camping Association, Minneapolis, Minn.

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